

**REMARKS**

Reconsideration of this application is requested.

The title has been changed as suggested by the Examiner.

The claims pending for consideration are claims 1-9 and 12-19. The Examiner has rejected these claims under 35 U.S.C. 102(b) as anticipated by Johnson et al. (WO 99/29788 A1). The applicants submit, for the reasons noted below, that Johnson et al. do not disclose the applicants' invention. Furthermore, the applicants' invention is also not obvious from Johnson et al. The Examiner has apparently recognized the non-obviousness of the applicants' invention with respect to Johnson et al. but appears to consider that the claims are readable on Johnson et al. and, therefore, anticipated thereby. With respect, however, the applicants submit that these claims differ from anything disclosed by Johnson et al., as noted below. Hence, withdrawal of the Section 102(b) rejection with allowance of all of the applicants' claims is requested.

The applicants' invention, as defined in their main claim 1, is concerned with a non-aqueous, substantially solvent-free and photoinitiator-free, particle beam curable ink having a viscosity less than 30m Pa.s at 60°C and comprising a specified amount of a colorant and a mixture of (meth)acrylate compounds comprising c% of one or more named mono (meth)acrylates, d% of one or more named di (meth)acrylates and e% of one or more named tri (meth)acrylates, the values of c%, d% and e% being such that the value of Formula (1) is less than or equal to 60. Johnson et al. do not disclose or suggest such a composition.

The applicants surprisingly have found that their invention offers substantially solvent-free, particle beam curable inks having good operability in an ink jet printer wherein the ink when cured demonstrates low leaching and good fat fastness. Such properties are desirable for printing inks which may be in food contact. Johnson et al. do not disclose such compositions as claimed by the applicants and say nothing about such problems of concern to the applicants.

More specifically, Johnson et al. do not disclose an ink which meets the value of Formula (1) as called for in claim 1, i.e. 60 or less. Johnson et al., therefore, do not anticipate the applicants' invention. If anything, Johnson et al. would lead one in the art away from the applicants' invention, particularly since Johnson et al. teach a preference for UV cure for which photoinitiators are essential. The applicants' compositions, as indicated above, are photoinitiator free. Thus, in short, the applicants' compositions are not anticipated by Johnson et al. Furthermore, while

obviousness is not a point raised by the Examiner, the applicants note that their compositions are not in any sense obvious from Johnson et al.

The Examiner's anticipation rejection is based on a miscalculation of the value of Formula (1) according to the Johnson et al. disclosure. Additionally, apart from this error in calculation, the Examiner's position is also based on Johnson et al. examples which include photoinitiators. This is directly contrary to the applicants' compositions.

As noted earlier, the applicants' claim 1 requires, *inter alia*, a mixture of mono, di and tri or higher functional (meth)acrylate compounds in proportions which, according to Formula (1), give a value of 60 or less and which are photoinitiator free.

Regarding Formula (1), in the broadest possible sense, Johnson et al. (WO 99/29788) disclose inks comprising:

at least 20% monofunctional material (page 15, last paragraph)

10 -35% difunctional material (page 16; second paragraph)

10 -30% tri or higher functional material (page 16, last paragraph)

Thus, hypothetically, the closest composition (relative to the applicants' composition) that is even conceivable from Johnson et al. is that wherein the amounts of di-functional and tri or higher functional materials take their highest possible values (i.e. 35% and 30%, respectively).

35% monofunctional c%

35% difunctional d%

30% tri or higher functional e%

The Examiner will note that in Johnson et al. the amounts of mono, di and tri or higher are by weight relative to the total amount of reactive liquid in the ink. Thus, taking the highest values for the di and tri or higher means the amount of monofunctional material must be the remainder needed to add up to 100% (i.e. 100-(35+30) which is 35%).

Using applicants' Formula (1), the value or the hypothetical composition of Johnson et al. can be calculated as follows:

$$= 35 + 0.628 \left( \frac{35}{\sin 60} + \frac{30}{\tan 60} \right)$$

$$= 26.3 + 0.62 (40.4 + 17.3)$$

= 71.23, i.e. a value which is not 60 or less or from 49 to 55.8 as the applicants' claims specify (claims 1 and 4, respectively).

Thus, even at its broadest possible teaching, Johnson et al. do not teach or even suggest the mixtures of (meth)acrylate monomers required by the applicants.

The Examiner quotes a value of 4.5 for the Magenta Example in Table 1 of Johnson et al. The Examiner gives no explanation as to how he arrived at this value. In any case, the applicants set out below the relevant calculations in full for this example:

The magenta ink in Table 1 of Johnson et al. comprises:

- 41.47% of isobornyl acrylate which is a mono (meth)acrylate;
- 23.00% Sartomer™ 306 (tripropylene glycol diacrylate) which is a di (meth)acrylate;
- 10% of Actilane™ 430 (trimethyl propane ethoxyate triacrylate) which is a tri- or higher (meth)acrylate; and
- 15% of Actilane™ 251 (trifunctional urethane acrylate prepolymer) which is a tri- or higher (meth)acrylate, i.e. 25% in total.

Thus, the total of (meth)acrylates is 41.47% + 23.00% + 25% which is 89.47%.

So because claim 1(ii) (b) relates to percentages relative to the total weight of mono, di and tri- or higher (meth)acrylates only, these values need to be converted to percentages of 89.47 parts. Accordingly,

$$c\% = 41.47/89.47 \times 100 = 46.4\%$$

$$d\% = 23.00/89.47 \times 100 = 25.7\%$$

$$e\% = 25/89.47 \times 100 = 27.9\%$$

which now sums to 100%.

One can then calculate Formula (1) which is:

$$46.4 + 0.628 (25.7/\sin 60 + 27.9/\tan 60)$$

$$= 46.4 + 0.628 (25.7/0.866 + 27.9/1.73)$$

$$= 46.4 + 0.628 (29.7 + 16.1)$$

$$= 46.4 + 0.628 (45.8)$$

$$= 46.4 + 28.8$$

= 75.2 which is clearly not equal to or less than 60 as required by the applicants.

Regarding photoinitiators in Table 1, the Magenta ink comprises Lucerin™ TPO and Darocure™ 1173 which as per page 26 are photoinitiators. Thus, contrary to applicants' claim 1, the Magenta ink, on which the Examiner relies, is a photoinitiator-containing ink.

The applicants are fully familiar with the teaching of Johnson et al., and looking at the actual examples in Johnson et al., e.g. page 25, Table 1; page 26, Table 2; page 27, Table 3 and page 29, Example 5, the closest to the present claims appears to be Example 5. This Example is slightly closer than that cited by the Examiner.

Example 5 discloses a composition containing:

20%	N-vinyl pyrrolidone	monofunctional
18.55%	Actilane™ 422	difunctional
15%	Actilane™ 251	tri or higher functional.

Relative to the sum of mono, di and tri or higher that is:

37.3% mono	c%
34.6% di	d%
28.0 tri or higher	e%.

Therefore, the value of Formula (1) for Johnson et al. Example 5 equals:

$$= 37.3 + 0.628 \left( \frac{34.6}{\sin 60} + \frac{28.0}{\tan 60} \right)$$

$$= 37.3 + 0.628 (39.95 + 16.17)$$

= 72.54, i.e. again significantly different from 60 or less called for by the applicants.

Again, it is noteworthy that Example 5 is not free from photoinitiator (c.f. Irgacure<sup>®</sup> 907, present at 10%ww).

The other examples in Johnson et al. are even further away than Example 5 since they contain about 40% of isobornyl acrylate. Thus, for example, in Example 1 of Johnson et al. at page 25, the value for Formula (1) equals 75.5, again outside the upper limit called for by the applicants. Furthermore, and once again, it is noteworthy that none of the Johnson et al. Examples in Tables 1, 2 and 3 are free from photoinitiator. Thus, in short, Johnson et al. do not anticipate the applicants' claims. In fact, to the contrary, Johnson et al. point away from the applicants' invention by teaching the use of insufficient amounts of di- and tri- or higher functional (meth)acrylates to meet the applicants' claim requirements.

In addition, Johnson teaches the importance of the inclusion of photoinitiators because it prefers UV cure (page 1, 1st paragraph; page 5, 3rd paragraph and page 17 last paragraph to page 18), thus again leading away from the invention.

Consistent with the foregoing, the applicants submit that their claims define subject matter which is new and unobvious from the cited art. Accordingly, favorable reconsideration with allowance is requested.

Respectfully submitted,  
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